

CLAIMS:

1. A method for controlling the number of cylinder strokes in at least a cylinder operating in a internal combustion engine, the method comprising:
  - operating at least a cylinder with a first number of strokes in a cycle of said cylinder, during at least a first operating condition of a catalyst; and
  - operating said cylinder with a second number of strokes in a cycle of said cylinder, during a second catalyst operating condition, said second catalyst operating condition different from said first catalyst operating condition.
2. The method of Claim 1 wherein said operating state of said catalyst brick is a oxidant storage capacity.
3. The method of Claim 1 wherein said operating state of said catalyst is an amount of oxidants stored by said catalyst brick.
4. The method of Claim 1 wherein said catalyst state is temperature of said catalyst brick.

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5. A method for controlling the number of cylinder valves in at least a cylinder operating in a internal combustion engine, the method comprising:

operating at least a cylinder with a first  
5 number of valves in a cycle of said cylinder, during at least a first operating condition of a catalyst; and  
operating said cylinder with a second number of valves in a cycle of said cylinder, during a second catalyst operating condition, said second catalyst  
10 operating condition different from said first catalyst operating condition.

6. The method of Claim 5 wherein said operating state of said catalyst brick is a oxidant storage capacity.

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7. The method of Claim 5 wherein said operating state of said catalyst is an amount of oxidants stored by said catalyst brick.

20 8. The method of Claim 5 wherein said catalyst state is temperature of said catalyst brick.

9. A method for controlling the valve pattern in at least a cylinder operating in a internal combustion  
25 engine, the method comprising:

operating at least a cylinder with a first valve pattern in a cycle of said cylinder, during at least a first operating condition of a catalyst; and  
operating said cylinder with a second valve  
30 pattern in a cycle of said cylinder, during a second catalyst operating condition, said second catalyst operating condition different from said first catalyst operating condition.

10. The method of Claim 9 wherein said operating state of said catalyst brick is a oxidant storage capacity.

11. The method of Claim 9 wherein said operating state  
5 of said catalyst is an amount of oxidants stored by said catalyst brick.

12. The method of Claim 9 wherein said catalyst state is temperature of said catalyst brick.

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13. A method for determining the number of cylinder strokes in a cycle an internal combustion engine, the method comprising:

determining an operating state of at least one  
15 catalyst brick located in an exhaust system of said internal combustion engine;

determining a number of cylinder strokes to delay a valve opening, in respective cylinders of said engine, after a combustion event, in respective  
20 cylinders, based on said catalyst brick operating state.

14. The method of Claim 13 wherein said valve is an intake valve.

25 15. The method of Claim 13 wherein said valve is an exhaust valve.

16. The method of Claim 13 wherein said operating state of said catalyst brick is a oxidant storage capacity.

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17. The method of Claim 13 wherein said operating state of said catalyst is an amount of oxidants stored by said catalyst brick.

18. The method of Claim 13 wherein said catalyst state is temperature of said catalyst brick.

19. A method for determining the number of cylinder  
5 strokes in a cycle of a cylinder of an internal combustion engine, the method comprising:

determining an operating condition of at least one catalyst brick located in an exhaust system of said internal combustion engine;

10 selecting a number of cylinders in which to delay a valve opening after a combustion event in respective cylinders based on said catalyst brick operating condition.

15 20. The method of Claim 19 wherein said valve is an intake valve.

21. The method of Claim 19 wherein said valve is an exhaust valve.

20 22. The method of Claim 19 wherein said operating state of said catalyst brick is a oxidant storage capacity.

23. The method of Claim 19 wherein said operating state  
25 of said catalyst is an amount of oxidants stored by said catalyst brick.

24. The method of Claim 19 wherein said catalyst state is temperature of said catalyst brick.

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25. A method for determining the number of cylinder strokes in a cycle of a cylinder of an internal combustion engine, the method comprising:

- 5 determining an operating condition of at least one catalyst brick located in an exhaust system of said internal combustion engine;
- selecting a number of cylinders in which to delay a valve opening after a combustion event in respective cylinders based on said catalyst brick
- 10 operating condition; and
- adjusting an air-fuel mixture in said number of selected cylinders.

26. The method of Claim 25 wherein said air-fuel is  
15 adjusted rich of stoichiometry.

27. The method of Claim 25 wherein said air-fuel is adjusted lean of stoichiometry.

20 28. The method of Claim 25 wherein said valve is an intake valve.

29. The method of Claim 25 wherein said valve is an exhaust valve.

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30. A method for determining the number of cylinder strokes in a cycle of a cylinder of an internal combustion engine, the method comprising:

- 5       determining an operating condition of at least  
one catalyst brick located in an exhaust system of said internal combustion engine;
- selecting a number of cylinders in which to delay a valve opening after a combustion event in respective cylinders, based on said catalyst brick  
10   operating condition;
- determining a number of valves to operate in said selected cylinders, based on said catalyst brick operating condition; and
- operating said number of valves in said  
15   selected cylinders during a cycle of said internal combustion engine.

31. The method of Claim 30 wherein said valve is an intake valve.

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32. The method of Claim 30 wherein said valve is an exhaust valve.

33. A method for determining the number of cylinder strokes and valve pattern in a cycle of a cylinder of an internal combustion engine, the method comprising:

5 determining an operating condition of at least  
one catalyst brick located in an exhaust system of said internal combustion engine;

selecting a number of cylinders in which to delay a valve opening after a combustion event in respective cylinders, based on said catalyst brick  
10 operating condition;

determining a valve pattern to operate in said selected cylinders, based on said catalyst brick operating condition; and

operating said number of valves in said  
15 selected cylinders during a cycle of said internal combustion engine.

34. A method for determining a valve pattern to operate in an internal combustion engine operating in a multi-stroke cylinder mode, the method comprising:

20 determining an operating condition of at least one catalyst brick located in an exhaust system of said internal combustion engine;

operating at least two groups of cylinders, a  
25 first group operating in a first cylinder stroke mode, and a second group operating in a second cylinder stroke mode; and

determining a valve pattern to operate, based on said operating condition, in said first cylinder group  
30 and in said second cylinder group.

35. A computer readable storage medium having stored data representing instructions executable by a computer to control an internal combustion engine of a vehicle, said storage medium comprising:

5           instructions for operating at least a cylinder with a first number of strokes in a cycle of said cylinder, based at least on an operating condition of a catalyst; and

          operating said cylinder with a second number of  
10 strokes in a cycle of said cylinder, based on a change in said catalyst operating condition.

36. A method for controlling the number of cylinder strokes in at least a cylinder operating in a internal  
15 combustion engine, the method comprising:

          operating at least a cylinder with a first number of strokes in a cycle of said cylinder, based at least on an operating condition of a catalyst; and

          operating said cylinder with a second number of  
20 strokes in a cycle of said cylinder, based on a change in said catalyst operating condition.

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